## CLAIMS

WE CLAIM:

1. A method for extracting energy, comprising:

initiating one or more chemical reactions in a gas volume; and

producing one or more reaction products in a gas phase,

wherein the one or more reaction products collide on a surface of a substrate and transfer reaction product energy associated with one or more reaction products to the surface.

2. The method of claim 1, wherein the one or more reaction products include one or more intermediate reaction products.

3. The method of claim 1, further including:

collecting the energy from the surface.

4. The method of claim 1, wherein the initiating one or more chemical reactions include stimulating one or more reactions in the volume by injecting one or more stimulants.

5. The method of claim 4, wherein the one or more stimulants include any one or more of catalyst, autocatalyst, hot carriers, electrical stimulant, optical stimulant, and additive.

6. The method of claim 3, wherein the collecting the energy from the surface includes allowing the energy to be transferred from the surface to a converter that converts the energy into one or more forms of useful energy.

7. The method of claim 6, wherein the converter includes a diode.

8. The method of claim 6, wherein the useful energy includes any one or more of electricity, radiation, and mechanical energy.

9. The method of claim 1, wherein the
producing one or more reaction products include allowing reactants in a gas phase to migrate by diffusion to react with stimulants in a volume near the surface of a substrate.

10. The method of claim 1, wherein the
producing one or more reaction products include allowing reactants in a gas phase to migrate by diffusion to react with stimulants in a volume on the surface of a substrate.

11. An energy extracting apparatus comprising:
a reaction stimulator for initiating a chemical reaction;
a substrate forming a collection surface;
a reaction region formed between the reaction stimulator and the collection surface; and
an energy converter in contact with the substrate,
wherein chemicals in a gas phase can react in the reaction region and collide with the substrate, transferring reaction energy from the products of the reaction occurring in the reaction region into the substrate and the transferred energy can be converted into a useful form of energy by the energy converter.

12. The energy extracting apparatus of claim 11, wherein the energy converter includes a diode.

13. The energy extracting apparatus of claim 11, wherein the energy converter includes a p-n junction diode.

14. The energy extracting apparatus of claim 11, wherein the energy converter includes Schottky diode.

15. The energy extracting apparatus of claim 11, wherein the distance from the most distant part of the reaction region normal to the surface is a predetermined multiple of the vibration energy diffusion length of the reactants.

16. The energy extracting apparatus of claim 11, wherein the reaction region further includes a second reaction stimulator.

17. The energy extracting apparatus of claim 16, wherein the second reaction stimulator includes any one or more of electrical simulator, optical stimulator, catalysts, hot wire, and chemical stimulator.

18. The energy extracting apparatus of claim 17, wherein the chemical stimulator includes any one or more of autocatalyst and free radical generator.

19. The energy extracting apparatus of claim 11, wherein the distance from the energy converter to the surface between conducting surface and reactants and along a normal to the conducting surface is a predetermined length.

20. The energy extracting apparatus of claim 11, wherein the substrate includes one or more atomic metal monolayers of one or more selected material.

21. The energy extracting apparatus of claim 20, wherein the one or more selected material includes any one or more of metals and semiconductors.

22. The energy extracting apparatus of claim 11, wherein the surface has a geometry favoring excitation of molecules during a reaction.

23. The energy extracting apparatus of claim 22, wherein the geometry favoring excitation of molecules includes atomic surface steps.

24. The energy extracting apparatus of claim 22, wherein the geometry favoring excitation of molecules includes atomic edges.

25. The energy extracting apparatus of claim 11, wherein the substrate includes one or more metals that tend not to acquire adsorbates.

26. The energy extracting apparatus of claim 25, wherein the one or more metals that tend not to acquire adsorbates include any one or more of platinum, palladium, rhodium, ruthenium, gold, and silver.

27. The energy extracting apparatus of claim 11, wherein the substrate includes a conducting surface having phonon bands with energy less than the multi-quantum vibrational relaxation.

28. The energy extracting apparatus of claim 27, wherein the conducting surface includes crystalline material.

29. The energy extracting apparatus of claim 27, wherein the conducting surface includes any one or more of palladium and platinum.

30. The energy extracting apparatus of claim 11, further including a channel formed from under and through the energy converter and the substrate to the reaction region, wherein any one or more of reactants and stimulants may be added using the channel into the reaction region.

31. The energy extracting apparatus of claim 30, wherein the any one or more of reactants and stimulants in the channel cool the energy converter.